

REMARKS

Applicant respectfully requests reconsideration. Claims 40-42, 44, 45, 47-49 and 106-145 remain pending in the application. No claims have been amended, cancelled or added. No new matter has been added.

Objection to Drawings

The drawings were objected to as not showing every feature of the invention specified in claims 126-130 and 134.

Applicant believes that the features of these claims (e.g., electrically conductive material, first electrical contact) are shown in the figures. For example, a number of figures (e.g., FIGS. 1-8) show electrically conductive material (i.e., contacts 20) formed in vias 24 extending from a side of the structure. Also, FIG. 7 shows first and second electrical contacts (i.e., contacts 16a-16c) formed over a gallium nitride material region 14. Though no figures specifically show electrically conductive material in direct contact with the first electrical contact as recited in claim 126 (or the specific recitations of 126-130 and 134), the general features in the claims are shown elsewhere in the figures, as noted above, so as sufficiently convey the concepts being recited in these claims to one of skill in the art. Moreover, the specification states that "backside contact 20 may extend substantially through the thickness of the device so that the backside contact also forms a contact on topside 18 of the device" (page 18, lines 20-22) which further supports the recitations in claims 126-130 and 134.

However, if the above comments do not sufficiently address the objection and the objection is maintained, Applicant would be willing to submit an amended figure that illustrates a backside contact extending to the topside of the device. Such amendments would be supported in the specification by the language noted above.

Accordingly, Applicant respectfully requests withdrawal of the objections to the drawings on this ground.

Rejection of Claims 126-143 under 35 U.S.C. 112

Claims 126-143 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Office Action states that the specification does not describe features in claims 126-130 and 134 so as to reasonably convey to one skill in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

However, as noted above, the specification states that “backside contact 20 may extend substantially through the thickness of the device so that the backside contact also forms a contact on topside 18 of the device” (page 18, lines 20-22). Such disclosure reasonably conveys to one of skill in the art that the inventors had possession of the subject matter recited in claims 126-130 and 134. The remaining claims that stand rejected on this ground depend from one or more of claims 126-130 and 134, and were not separately cited as not otherwise complying with the written description requirement.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 40-42, 47-49, 106-112, 115, 116, 123-125, 127, 144 and 145

Claims 40-42, 47-49, 106-112, 115, 116, 123-125, 127, 144 and 145 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,537,654 (Berenz) in view of U.S. Patent No. 6,521,917 (Takayama).

The Office Action acknowledges that Berenz does not disclose a gallium nitride material region, but asserts that it would have been obvious to one of ordinary skill in the art to replace the gallium arsenide material taught in Berenz with the gallium nitride material taught in Takiyama.

However, there would have been no reasonable expectation of success when modifying the Berenz device to include a gallium nitride material region instead of a gallium arsenide material region. As noted in Takiyama, using gallium nitride-based material regions in device structures can lead to generation of significant defects in such regions resulting from lattice constant differences (e.g., See Takiyama, Col. 11, lines 6-10). Takiyama does allegedly address defect generation by proposing a structure including specific layer arrangements. However, it is not reasonable to expect that the structure proposed by Takiyama would be compatible with the processing steps required to

form the Berenz device. Moreover, it is not reasonable to expect that such attempts to modify the Berenz device would produce a device having the desired performance attributes.

Further, Applicant fails to see why one of ordinary skill in the art would have been motivated to combine the teachings of Berenz and Takayama.

For at least these reasons, a prima facie case of obviousness has not been met. Thus, the above-noted claims are not obvious in view of the combination of Takiyama and Berenz.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 44-45 and 113

Claims 44, 45 and 113 were rejected under 35 U.S.C. 103(a) as being unpatentable over Berenz in view of Takayama and further in view of U.S. Patent No. 6,120,600 (Edmond).

Claims 44, 45 and 113 depend from claim 40. As noted above, claim 40 is patentable over the combination of Berenz in view of Takayama because there would have been no reasonable expectation of success when modifying the Berenz device to include a gallium nitride material region as taught by Takayama instead of a gallium arsenide material region, and one of ordinary skill in the art would not have been motivated to make such modification. Edmond fails to provide these deficiencies. For at least this reason, claims 44, 45 and 113 are not obvious in view of the Berenz, Takayama and Edmond combination.

Furthermore, Edmond discloses the presence of a buffer layer between a silicon carbide substrate and overlying gallium nitride material layers. Applicant sees no reason that why one of skill in the art would seek to modify the structure resulting from the Berenz and Takayama combination to include a buffer layer, since the Berenz and Takayama combination does not include a substrate having a composition different than that of the overlying layers. Thus, there would have been no motivation to combine the references in the manner stated in the Office Action.

Moreover, it is it is not reasonable to expect that the Edmond buffer layer would be compatible with the processing steps required to form the Berenz device and that the resulting device would have suitable properties.

For at least these reasons, a prima facie case of obviousness has not been met. Thus, the above-noted claims are not obvious in view of the combination of Berenz, Takayama and Edmond.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claim 114

Claim 114 was rejected under 35 U.S.C. 103(a) as being unpatentable over Berenz in view of Takayama and further in view of U.S. Patent No. 5,192,987 (Kahn).

Claim 114 depends from claim 40. As noted above, claim 40 is patentable over Berenz in view of Takayama because there would have been no reasonable expectation of success when modifying the Berenz device to include a gallium nitride material region as taught by Takayama instead of a gallium arsenide material region, and one of ordinary skill in the art would not have been motivated to make such modification. Kahn fails to provide these deficiencies. For at least this reason, claim 114 is not obvious in view of the Berenz, Takayama and Kahn combination.

Furthermore, Applicant respectfully disagrees that one of skill in the art would have been motivated to modify the structure resulting from the Berenz and Takayama combination to include an $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer as taught by Kahn. Moreover, it is not reasonable to expect that the Kahn $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer would be compatible with the processing steps required to form the Berenz device and that the resulting device would have suitable properties.

For at least these reasons, a prima facie case of obviousness has not been met. Thus, claim 114 is not obvious in view of the combination of Berenz, Takayama and Kahn.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 117, 121 and 122 under 35 U.S.C. 103(a)

Claims 44, 45 and 113 were rejected under 35 U.S.C. 103(a) as being unpatentable over Berenz in view of Takayama and further in view of U.S. Patent No. 6,156,581 (Vaudo).

Claims 44, 45 and 113 depend from claim 40. As noted above, claim 40 is patentable over Berenz in view of Takayama because there would have been no reasonable expectation of success

when modifying the Berenz device to include a gallium nitride material region as taught by Takayama instead of a gallium arsenide material region, and one of ordinary skill in the art would not have been motivated to make such modification. Vaudo fails to provide these deficiencies. For at least this reason, claims 44, 45 and 113 are not obvious in view of the Berenz, Takayama and Vaudo combination.

Furthermore, Applicant respectfully disagrees that one of skill in the art would have been motivated to modify the structure resulting from the Berenz and Takayama combination to include different substrate materials such as Si, SiC and sapphire as allegedly taught by Vaudo. In fact, Vaudo points out difficulties when using “foreign substrates” (e.g., Si, SiC and sapphire) for gallium nitride material growth and suggests that gallium nitride material substrates would be more effective (e.g., See Column 1, lines 42-44). Takayama discloses a structure including a gallium nitride material substrate and gallium nitride material overlying layers (e.g., See FIG. 17A). Thus, one of ordinary skill in the art would not have motivated to modify the structure resulting from the Berenz and Takayama combination to include a “foreign substrate” as taught by Vaudo. Moreover, it is not reasonable to expect that such substrates would be compatible with the processing steps required to form the Berenz device and that the resulting device would have suitable properties.

For at least these reasons, a prima facie case of obviousness has not been met. Thus, claims 44, 45 and 113 are not obvious in view of the combination of Berenz, Takayama and Vaudo.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 118-120

Claims 118-120 were rejected under 35 U.S.C. 103(a) as being unpatentable over Berenz in view of Takayama in view of Vaudo and further in view of Edmond.

Claims 118-120 depend from claim 40. As noted above, claim 40 is patentable over Berenz in view of Takayama because there would have been no reasonable expectation of success when modifying the Berenz device to include a gallium nitride material region as taught by Takayama instead of a gallium arsenide material region, and one of ordinary skill in the art would not have been motivated to make such modification. Moreover, one of ordinary skill in the art would not

have been motivated to combine Berenz in view of Takayama and further in view of Edmond as described above. Takayama fails to provide the deficiencies of these combinations. For at least this reason, claims 118-120 are not obvious in view of the Berenz, Takayama, Vaudo and Edmond combination.

Furthermore, Applicant respectfully disagrees that one of skill in the art would have been motivated to modify the structure resulting from the Berenz, Takayama and Vaudo combination to include a buffer layer as taught by Edmond. Moreover, it is not reasonable to expect that such buffer layers would be compatible with the processing steps required to form the Berenz device and that the resulting device would have suitable properties.

Also, there is no teaching in any of the references about how to produce a gallium nitride material region having the thicknesses and crack levels recited in claims 119 and 120. Thus, even if the references were combined in the manner stated in the office action, such features are not taught or suggested by the combination.

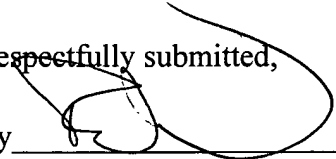
For at least these reasons, a prima facie case of obviousness has not been met. Thus, claims 118-120 are not obvious in view of the combination of Berenz, Takayama, Vaudo and Edmond.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

In view of the above, Applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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